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# PETITION FEE
Under 37 CFR 1.17(f), (g) & (h)
## TRANSMITTAL
(Fees are subject to annual revision)

**Send completed form to: Commissioner for Patents**
**P.O. Box 1450, Alexandria, VA 22313-1450**

| | |
|---|---|
| *Application Number* | **10/783,337** |
| *Filing Date* | **February 20, 2004** |
| *First Named Inventor* | **M. ARAI, et al** |
| *Art Unit* | |
| *Examiner Name* | |
| *Attorney Docket Number* | **H-1213** |

**Enclosed is a petition filed under 37 CFR §1.102(d) that requires a processing fee (37 CFR 1.17(f), (g), or (h)). Payment of $ 130.00 is enclosed.**

This form should be included with the above-mentioned petition and faxed or mailed to the Office using the appropriate Mail Stop (e.g., Mail Stop Petition), if applicable. For transmittal of processing fees under 37 CFR 1.17(i), see form PTO/SB/17i.

**Payment of Fees** (small entity amounts are NOT available for the petition (fees)

☒ The Commissioner is hereby authorized to charge the following fees to Deposit Account No. 50-1417:
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**Petition Fees under 37 CFR 1.17(f): Fee $400 Fee Code 1462**
For petitions filed under:
§ 1.53(e) - to accord a filing date.
§ 1.57(a) - to according a filing date.
§ 1.182 – for decision on a question not specifically provided for.
§ 1.183 – to suspend the rules.
§ 1.378(e) for reconsideration of decision on petition refusing to accept delayed payment of maintenance fee in an expired patent.
§ 1.741(b) – to accord a filing date to an application under §1.740 for extension of a patent term.

**Petition Fees under 37 CFR 1.17(g): Fee $200 Fee code 1463**
For petitions filed under:
§1.12 - for access to an assignment record.
§1.14 - for access to an application.
§1.47 - for filing by other than all the inventors or a person not the inventor.
§1.59 - for expungement of information.
§1.103(a) - to suspend action in an application.
§1.136(b) - for review of a request for extension of time when the provisions of section 1.136(a) are not available.
§1.295 - for review of refusal to publish a statutory invention registration.
§1.296 - to withdraw a request for publication of a statutory invention registration filed on or after the date the notice of intent to publish issued.
§1.377 – for review of decision refusing to accept and record payment of a maintenance fee filed prior to expiration of a patent.
§1.550(c) – for patent owner requests for extension of time in ex parte reexamination proceedings.
§1.956 – for patent owner requests for extension of time in inter partes reexamination proceedings.
§ 5.12 – for expedited handling of a foreign filing license.
§ 5.15 – for changing the scope of a license.
§ 5.25 – for retroactive license.

**Petition Fees under 37 CFR 1.17(h): Fee $130 Fee Code 1464**
For petitions filed under:
§1.19(g) – to request documents in a form other than that provided in this part.
§1.84 – for accepting color drawings or photographs.
§1.91 – for entry of a model or exhibit.
§1.102(d) – to make an application special.
§1.138(c) – to expressly abandon an application to avoid publication.
§1.313 – to withdraw an application from issue.
§1.314 – to defer issuance of a patent.

| | | | |
|---|---|---|---|
| *Name (Print/Type)* | **Daniel J. Stanger** | *Registration No. (Attorney/Agent)* | **32,846** |
| *Signature* | | *Date* | July 19, 2005 |

H-1213

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant(s): M. ARAI, et al

Serial No.: 10/783,337

Filed: February 20, 2004

For: MAGNETIC DISK ARRAY DEVICE WITH PROCESSING OFFLOAD

**PETITION TO MAKE SPECIAL**
**UNDER 37 CFR §1.102(MPEP §708.02)**

**MS Petition**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

July 19, 2005

Sir:

Applicants hereby petition the Commissioner to make the above-identified application special in accordance with 37 CFR §1.102(d). Pursuant to MPEP §708.02(VIII), Applicants state the following.

**(A) This Petition is accompanied by the fee set forth in 37 CFR §1.17(h).**

The Commissioner is hereby authorized to charge any additional payment due, or to credit any overpayment, to Deposit Account No. 50-1417.

**(B) All claims are directed to a single invention.**

If the Office determines that all claims are not directed to a single invention, Applicant will make an election without traverse as a prerequisite to the grant of special status in conformity with established telephone restriction practice.

**(C) A pre-examination search has been conducted.**

The search was directed towards a storage system. In particular, the search was directed to the invention set forth in claims 1-20. According to claim 1, the invention is a disk array system comprising: at least one ATA magnetic disk; at least one disk array controller for controlling the ATA magnetic disk; and at least one interface card having a processing offload function module, existing on a path between the disk array controller and the ATA magnetic disk, wherein the disk array controller outputs to the interface card one of a standard processing FC command for performing a standard processing, and an offload processing FC command for performing a vendor-unique offload processing, the processing offload function module uses a command mapping table to issue to the ATA magnetic disk an ATA command that corresponds to the standard processing FC command.

The search of the above features was conducted in the following areas:

| Class | Subclasses |
|---|---|
| 707 | 9, 10, 102, 104.1 |
| 709 | 203, 217, 219, 229, 250 |
| 710 | 1, 5, 28, 35, 57 |
| 711 | 111-114, 148-156, 161-165, 170-173 |
| 714 | 1, 5-8 |

Additionally, a computer database search was conducted on the USPTO systems EAST and WEST.

**(D) The following is a list of the references deemed most closely related to the subject matter encompassed by the claims:**

| U.S. Patent Number | Inventors |
|---|---|
| 5,905,885 | Richter et al |
| 6,381,675 | Okada |
| 6,421,760 | McDonald et al |
| 6,496,900 | McDonald et al |
| 6,526,458 | Steinmetz et al |
| 6,834,326 | Wang et al |

| U.S. Patent Application Publication No. | Inventor(s) |
|---|---|
| 2003/0041278 | Lin |
| 2003/0046472 | Morrow |
| 2004/0010660 | Konshak et al |
| 2005/0097271 | Davies et al |

A copy of each of these references (as well as other references uncovered during the search) is enclosed in an accompanying IDS.

**(E) It is submitted that the present invention is patentable over the references for the following reasons.**

It is submitted that the cited references, whether taken individually or in combination with each other, fail to teach or suggest the invention as claimed. In particular, the cited references, at a minimum, fail to teach or suggest in combination with the other limitations recited in the claims:

a first feature of the present invention as recited in each of independent claims 1, 7, 10 and 14 of a processing offload function module (or section as recited in claim 7) that uses a command mapping table to issue to the ATA

magnetic disk and ATA command that corresponds to the standard processing FC command, and

a second feature of the present invention as recited in independent claim 19 wherein when a FC command from the disk array controller is the standard processing FC command and is to access the ATA magnetic disk, the processing offload function module uses a command mapping table to issue, via the interface card to the ATA magnetic disk, an ATA command that corresponds to the standard processing FC command.

To the extent applicable to the present Petition, Applicants submit that although the distinguishing feature(s) may represent a substantial portion of the claimed invention, the claimed invention including said feature(s) and their inter-operation provides a novel storage system and system and method related to or implemented in or by said storage system not taught or suggested by any of the references of record.

The references considered most closely related to the claimed invention are briefly discussed below:

Richter (U.S. Patent No. 5,905,885) discloses a peripheral interface system and apparatus including a pair of integrated circuits, referred to as a system adapter and a socket controller, using a communication protocol, referred to as a windowed-interchip-communication protocol, to interface peripherals, such as PCMCIA cards or infrared devices, and other subsystems having different formats with a CPU system bus. The system adapter communicates to a hard disk drive subsystem using the ATA communication standards to interface

an ATA hard disk drive with the CPU system bus. Communication between the system adapter and the socket controller, which communicates with PCMCIA peripheral cards and IR peripherals, is accomplished using the windowed-interchip-communication protocol which may share hardware resources with other communication protocols. Communication between the system adapter and the hard disk drive and between the system adapter and the socket controller may be provided on the same chain of a standard signal ribbon cable. Alternatively communication between an expansion board and a socket controller may be performed across a cable separate from the hard disk drives having a different signal line format. The system adapter may be included within a single interface expansion board which can be connected to the motherboard and CPU system bus or it can be directly connected or soldered to the motherboard and communicate with the socket controller and ATA hard disk drives using one or more busses. (See, e.g., Abstract and column 5, line 16, through column 6, line 44).

However, unlike the present invention, Richter does not teach or suggest a processing offload function module that uses a command mapping table to issue to the ATA magnetic disk an ATA command that corresponds to the standard processing FC command.

More particularly, Richter does not teach or suggest the above described first feature of the present invention as recited in each of independents claim 1, 7, 10 and 14, and the above described second feature of the present invention as

recited in independent claim 19 in combination with the other limitations recited in each of the independent claims.

Okada (U.S. Patent No. 6,381,675) discloses a disk array system that includes: a plurality of arrayed disk apparatuses for writing/reading data; a plurality of array controllers for controlling writing/reading a data to/from the disk apparatuses according to an instruction from a host computer; and a switching mechanism connected to each of the disk apparatuses, for establishing an exclusive connection between the array controllers and the disk apparatuses. When one of the array controllers has acquired from the other array controllers a control authority over all or one of the disk apparatuses according to an instruction from a host computer, the array controller having the control authority controls the switching mechanism to establish a connection between the array controller and the disk apparatuses. Means for this connection is also provided in the system. Referring to FIG. 6, the CPU has functions as an ATA interface controller, a switch circuit controller, a transfer controller, and a trouble decision controller. In this example, the ROM contains the following programs stored in advance: a program for controlling a disk apparatus according to the ATA interface; a program for producing a path switching signal to the switch circuit; a program for performing assignment of the control authority for data transfer and an actual data transfer; and a program for deciding whether a disk apparatus and a switch circuit have an error. (See, e.g., Abstract; column 1, line 53, through column 2, line 6; column 5, line 48, through column 6, line 5; and Figure 6).

However, unlike the present invention, Okada does not teach or suggest a processing offload function module that uses a command mapping table to issue to the ATA magnetic disk an ATA command that corresponds to the standard processing FC command.

More particularly, Okada does not teach or suggest the above described first feature of the present invention as recited in each of independents claim 1, 7, 10 and 14, and the above described second feature of the present invention as recited in independent claim 19 in combination with the other limitations recited in each of the independent claims.

McDonald (U.S. Patent No. 6,421,760) discloses an automated controller that implements a host side of a standard ATA interface protocol within automated circuitry to control an ATA disk drive. The automated controller preferably comprises a command buffer for storing disk drive commands to be executed by the ATA drive, and a data buffer that stores I/O data being transferred to or from the ATA disk drive. By automating the host side of the ATA protocol, the system provides a high degree of I/O performance, particularly in the context of RAID and other disk array systems. The automated controller may, for example, be embodied within an ASIC or FPGA device. One particular embodiment of the invention is a disk array controller that controls a plurality of ATA disk drives. The automated controllers are connected by a control bus to a microcontroller that dispatches disk drive commands to the automated controllers in response to I/O requests from a host computer. The microcontroller is preferably programmed to support one or more RAID configurations. The

automated controllers are also connected by a second bus to an automated processor. The automated processor transfers I/O data between the automated controllers/ATA disk drives and the host computer, and tracks the completion statuses of pending I/O requests. (See, e.g., Abstract and column 2, lines 10-37).

However, unlike the present invention, McDonald '760 does not teach or suggest a processing offload function module that uses a command mapping table to issue to the ATA magnetic disk an ATA command that corresponds to the standard processing FC command.

More particularly, McDonald '760 does not teach or suggest the above described first feature of the present invention as recited in each of independents claim 1, 7, 10 and 14, and the above described second feature of the present invention as recited in independent claim 19 in combination with the other limitations recited in each of the independent claims.

McDonald (U.S. Patent No. 6,496,900) discloses a controller and an associated method, which may be embodied within a disk array system, for verifying, the integrity of command data written to a disk drive (preferably an Advanced Technology Attachment or ATA drive) before such command data is used to execute a command. The controller, which may be implemented in automated hardware or firmware residing external to the disk drive, initially writes the command data to the disk drive, and then reads back and verifies this data prior to initiating execution of the command. If the written-out and read-back command data are consistent, the controller initiates execution of the command;

otherwise, the controller enters into an error state that prevents the potentially corrupt command data from being used by the disk drive. The controller may also read a status code from the disk drive more than once to reduce the likelihood of misread status information. (See, e.g., Abstract and column 1, line 47, through column 2, line 15).

However, unlike the present invention, McDonald '900 does not teach or suggest a processing offload function module that uses a command mapping table to issue to the ATA magnetic disk an ATA command that corresponds to the standard processing FC command.

More particularly, McDonald '900 does not teach or suggest the above described first feature of the present invention as recited in each of independents claim 1, 7, 10 and 14, and the above described second feature of the present invention as recited in independent claim 19 in combination with the other limitations recited in each of the independent claims.

Steinmetz (U.S. Patent No. 6,526,458) discloses a method and system that executes host-initiated I/O operations in fibre channel nodes, and, in particular, to a method and system for employing an application specific integrated circuit and increased functionality within an interface controller component of the fibre channel node in order to eliminate unnecessary data transfers between the interface controller and the host computer or computer peripheral component of the fibre channel node and to offload processing from the host computer or computer peripheral component of the fibre channel node to

the interface controller component and to the application specific integrated circuit. (See, e.g., Abstract and column 2, line 52, through column 3, line 34).

However, unlike the present invention, Steinmetz does not teach or suggest a disk array controller that outputs to the interface card one of a standard processing FC command for performing a standard processing, and an offload processing FC command for performing a vendor-unique offload processing.

More particularly, Steinmetz does not teach or suggest the above described first feature of the present invention as recited in each of independents claim 1, 7, 10 and 14, and the above described second feature of the present invention as recited in independent claim 19 in combination with the other limitations recited in each of the independent claims.

Wang (U.S. Patent No. 6,834,326) discloses a method and device for connecting redundant disk drives to a controller, preferably an intelligent switch, via a network. The disks are controlled by commands transported across the network. Commands may be SCSI, IDE/ATA or other commands. The network may comprise Ethernet, fiber channel or other physical layer protocol. Commands can be encapsulated in IP packets and transmitted using either a reliable or unreliable transport protocol. Multicasting of packets from the controller to the multiple disk drives is part of the present invention. Wang also discloses RAID controllers that come with on-board DSP's and memory cache that can off-load considerable amount of processing from the main CPU, as well as allow high transfer rates into the large controller cache. For RAID which

incorporates parity checks (for protection against disk-failure), parity calculations are done in RAID hardware which speeds up processing considerably. RAID hardware offers an advantage over pure software RAID, in that it potentially can make use of disk-spindle synchronization and its knowledge of the disk-platter position with regard to the disk head (scheduling), and the desired disk-block. (See, e.g., Abstract and column 2, lines 24-61).

However, unlike the present invention, Wang does not teach or suggest a processing offload function module that uses a command mapping table to issue to the ATA magnetic disk an ATA command that corresponds to the standard processing FC command.

More particularly, Wang does not teach or suggest the above described first feature of the present invention as recited in each of independents claim 1, 7, 10 and 14, and the above described second feature of the present invention as recited in independent claim 19 in combination with the other limitations recited in each of the independent claims.

Lin (U.S. Patent Application Publication No. 2003/0041278) discloses a disk array control apparatus comprising a disk array control unit, an interface converter and a network interface unit. The disk array control unit has a parallel interface for transmitting and receiving a plurality of parallel signals and a shared bus interface for transmitting and receiving stored data. The interface converter converts the parallel signals into corresponding differential signals when receiving the parallel signals from the disk array control unit, and converts a plurality of external differential signals into the corresponding parallel signals

when the disk array control unit receiving data from the parallel interface. The network interface unit has a network I/O port connecting with an external network. The network interface unit is also connected to the shared bus interface. The stored data is passed from the shared bus interface through the network I/O port to the external network, and the remote data is passed from the external network through the network I/O port to the shared bus interface. As shown in FIG. 1, the network storage device comprises a disk array control apparatus, a disk array apparatus comprising a plurality of disk devices and its relevant interface converter. The disk devices are IDE/ATA hard disk drives. Each of the IDE/ATA hard disk drives provides a set of IDE/ATA interface signals. (See, e.g., Abstract and paragraphs 5-7, and 13, and Figure 1).

However, unlike the present invention, Lin does not teach or suggest a processing offload function module that uses a command mapping table to issue to the ATA magnetic disk an ATA command that corresponds to the standard processing FC command.

More particularly, Wang does not teach or suggest the above described first feature of the present invention as recited in each of independents claim 1, 7, 10 and 14, and the above described second feature of the present invention as recited in independent claim 19 in combination with the other limitations recited in each of the independent claims.

Morrow (U.S. Patent Application Publication No. 2003/0046472) discloses a method and system for the offloading of protocol control and conversion information within microprocessor-based systems. A converter controller

comprises a first interface and protocol, as well as a second interface and protocol. An intermediate protocol and interface is interconnected to both the first protocol and the second protocol, and forwards or offloads protocol information to the system CPU, which comprises device driver information for protocol conversion and/or control. The CPU acts upon the received protocol information, performs protocol conversion as necessary, and forwards the converted protocol information back to the converter controller through the intermediate interface. Some embodiments of the offloading protocol conversion system comprise a SDIO controller within a USB-based device. A MediaBay adapter is reported as a 16-bit PC Card ATA device. In one embodiment of the architecture, the MediaBay CIS identifies a Media Bay adapter, as a standard ATA compatible device, such that the ATA disk driver provided by the operating system is loaded. (See, e.g., Abstract and paragraphs 36 and 134).

However, unlike the present invention, Morrow does not teach or suggest a processing offload function module that uses a command mapping table to issue to the ATA magnetic disk an ATA command that corresponds to the standard processing FC command.

More particularly, Morrow does not teach or suggest the above described first feature of the present invention as recited in each of independents claim 1, 7, 10 and 14, and the above described second feature of the present invention as recited in independent claim 19 in combination with the other limitations recited in each of the independent claims.

Konshak (U.S. Patent Application Publication No. 2004/0010660) discloses a self-contained data storage module that receives a data request conforming to a first standard. The data request is translated into a second standard. At least one of the storage devices mounted on a board within the data storage module is identified. The translated data request is transmitted to each identified storage device, where the data request is serviced. Personality logic is programmable to allow the data storage module to appear as one or more of a variety of different storage devices. For example, a device accessing data storage module through media may believe it is communicating with a single SCSI disk drive. Personality logic receives SCSI access commands, determines which, if any, of disk drives will respond to the SCSI command, generates any ATA commands necessary to implement the received SCSI command, and forwards these ATA commands to controller. Personality logic can be programmed to make data storage module appear as one or more disk drives, tape drives, tape auto loaders, tape libraries, optical devices, and the like. Further, personality logic may be programmed to permit data storage module to respond as if it were a SCSI device, iSCSI device, ESCON device, or any device having other storage command formats. Personality logic may be programmed to provide data storage module with features not available with the type of storage device implemented in storage modules. For example, ATA disk drives traditionally have not support command queuing. Personality logic may be programmed to permit data storage module to appear as a SCSI device which supports command queuing. SCSI commands received over media are queued

within personality logic and released as ATA commands to controller one at a time. Another example is the SCSI command to "write same," which permits the same data to be simultaneously written to several SCSI storage devices. Personality logic, upon receiving such a command, would determine which disk drives represent the virtual SCSI storage devices requested in the command and generate appropriate ATA commands for disk drives to write multiple copies of the data. (See, e.g., Abstract and paragraphs 39-49).

However, unlike the present invention, Konshak does not teach or suggest a disk array controller that outputs to the interface card one of a standard processing FC command for performing a standard processing, and an offload processing FC command for performing a vendor-unique offload processing

More particularly, Konshak does not teach or suggest the above described first feature of the present invention as recited in each of independents claim 1, 7, 10 and 14, and the above described second feature of the present invention as recited in independent claim 19 in combination with the other limitations recited in each of the independent claims.

Davies (U.S. Patent Application Publication No. 2005/0097271) discloses a storage controller in which the access control function is performed by a host interface adapter in the storage controller rather than by the microprocessor, thereby offloading the access control function from the microprocessor and freeing up the microprocessor to perform its other functions more effectively. The storage controller includes a storage device interface adapter that interfaces a plurality of logical storage devices to the storage controller. The storage

controller also includes at least one host interface adapter that interfaces a plurality of host computers to the storage controller. The storage controller also includes a microprocessor that processes requests by the hosts to access the logical storage devices. When the host interface adapter receives a request from one of the hosts, the host interface adapter looks up the host identifier and logical storage device identifier specified in the request in an access control table to determine whether the specified host has access to the specified logical storage device. If so, the host interface adapter forwards the request to the microprocessor for processing. If the request is a read request, the microprocessor controls the device interface adapter to transfer data from the specified logical storage device to a buffer on the storage controller and controls the host interface adapter to transfer the data from the buffer to the host. If the request is a write request, the microprocessor controls the host interface adapter to transfer data from the host to the buffer and then controls the device interface adapter to transfer data from the buffer to the specified logical storage device. The microprocessor manages use of the buffer amongst various requests and data transfers. (See, e.g., Abstract and paragraphs 10-14).

However, unlike the present invention, Davies does not teach or suggest a processing offload function module that uses a command mapping table to issue to the ATA magnetic disk an ATA command that corresponds to the standard processing FC command.

More particularly, Davies does not teach or suggest the above described first feature of the present invention as recited in each of independents claim 1,

7, 10 and 14, and the above described second feature of the present invention as recited in independent claim 19 in combination with the other limitations recited in each of the independent claims.

Therefore, since the cited references fail to teach or the above described first feature of the present invention as recited in each of independent claims 1, 7, 10 and 14, and the above described second feature of the present invention as recited in independent claim 19 in combination with the other limitations recited in each of the independent claims, it is submitted that all of the claims are patentable over the cited references whether said references are taken individually or in combination with each other.

**(F) Conclusion**

Applicant has conducted what it believes to be a reasonable search, but makes no representation that "better" or more relevant prior art does not exist. The United States Patent and Trademark Office is urged to conduct its own complete search of the prior art, and to thoroughly examine this application in view of the prior art cited herein and any other prior art that the United States Patent and Trademark Office may locate in its own independent search. Further, while Applicant has identified in good faith certain portions of each of the references listed herein in order to provide the requisite detailed discussion of how the claimed subject matter is patentable over the references, the United States Patent and Trademark Office should not limit its review to the identified portions but rather, is urged to review and consider the entirety of each

reference, and not to rely solely on the identified portions when examining this application.

In view of the foregoing, Applicant requests that this Petition to Make Special be granted and that the application undergo the accelerated examination procedure set forth in MPEP 708.02 VIII.

**(G) Fee (37 C.F.R. 1.17(h))**

The fee required by 37 C.F.R. § 1.17(h) is to be paid by:

[ X] the Credit Card Payment Form (attached) for $130.00.

[ ] charging Account _____ the sum of $130.00.

A duplicate of this petition is attached.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (H-1213).

Respectfully submitted,

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.

Daniel J. Stanger
Reg. No. 32,846

DJS/CIB/jdc
(703) 684-1120